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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A123139
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) A Table for Rapid Determination of Log_{10} LD_{50} or ID_{50} Values	5. TYPE OF REPORT & PERIOD COVERED N/A
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Ralph W. Kuehne	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Medical Research Institute of Infectious Diseases SGRD-UIZ-S Fort Detrick, Frederick, MD 21701	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS N/A
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Medical Research and Development Command, Office of the Surgeon General Dept. of the Army, Washington, DC 20314	12. REPORT DATE 7 Oct 82
	13. NUMBER OF PAGES 6 pages
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES
To be published in the Journal of Clinical Microbiology

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
LD_{50}, 50% endpoint

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
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DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE

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A Table for Rapid Determination of Log_{10} LD_{50} or ID_{50} Values

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ABSTRACT

A reference table is presented for rapid determination of LD_{50} or ID_{50} values when administering 10-fold serial dilutions to six animals per dilution.

While the determination of an LD_{50} or ID_{50} is neither a complicated nor a difficult procedure (1), many laboratories continue to perform these calculations on each titration manually. In some of our laboratory areas where access to a computer is not readily available, the table (Table 1) presented below has been of great value in saving time, reducing errors, and enabling even untrained personnel to record LD_{50} values from titration results. Values shown are for titrations utilizing six animals per point, a commonly used number for titrating viruses or sera for antibody (2). The method of Reed and Muench (1) "utilizes, at least in part, the large, total number of animals involved. The effect is that of using, at the two critical dilutions between which the endpoint lies, larger groups of animals than were actually included at these dilutions."

To use the table, let A represent the $\log_{10}$ of the highest dilution showing the desired effect (mortality, infectivity, immunity, survival, etc.) in 6/6 animals, and B through E the $\log_{10}$ of the four next consecutive 10-fold dilutions.

Typical titration examples are given in Table 2. Example number 2 shows a titration giving the following results: 10^{-2} = 6/6, 10^{-3} = 6/6, 10^{-4} = 4/6, 10^{-5} = 2/6, 10^{-6} = 2/6 and 10^{-7} = 0/6. In this instance, A = 3 (the $\log_{10}$ of the highest dilution showing the effect in all animals), B = 4, C = 5, etc. The value from Table 1 would be derived from the line showing 6, 4, 2, 2, 0 (bracketed results in Table 2), or 0.75. Since B = 4 in this example, the $\log_{10}$ LD_{50} would equal 4.75.

The table assumes that no more than five dilutions are required to accomplish 100 to 0% response, and that an orderly dose-response relationship exists. Since the mantissa of each value shown represents the proportionate distance between two adjacent dilutions, this number can also be applied to calculate the 50% endpoint when dilutions other than 10-fold are used, i.e., to other log bases.

LITERATURE CITED

1. Reed, L. J., and H. Muench. 1938. A simple method of estimating fifty per cent endpoints. Am. J. Hyg. 27:493-497.

2. Lennette, E.H. 1964. General principles underlying laboratory diagnosis of viral and rickettsial infections, p. 1-66. In E. H. Lennette and N. J. Schmidt (ed.), Diagnostic procedures for viral and rickettsial diseases, 3rd ed. American Public Health Association, New York.

TABLE 1. Log_{10} LD_{50} or ID_{50} Values for 6 Animals/Dilution

*10^{-A}	10^{-B}	10^{-C}	10^{-D}	10^{-E}	LD_{50}	*10^{-A}	10^{-B}	10^{-C}	10^{-D}	10^{-E}	LD_{50}
6	5	5	5	0	D.20	6	4	3	1	0	B.84
6	5	5	4	0	D.00	6	4	3	0	0	B.69
6	5	5	3	0	C.71	6	4	2	2	0	B.75
6	5	5	2	0	C.53	6	4	2	1	0	B.63
6	5	5	1	0	C.40	6	4	2	0	0	B.50
6	5	5	0	0	C.30	6	4	1	1	0	B.47
6	5	4	4	0	C.80	6	4	1	0	0	B.36
6	5	4	3	0	C.55	6	4	0	0	0	B.25
6	5	4	2	0	C.38	6	3	3	3	0	C.00
6	5	4	1	0	C.24	6	3	3	2	0	B.83
6	5	4	0	0	C.13	6	3	3	1	0	B.67
6	5	3	3	0	C.33	6	3	3	0	0	B.50
6	5	3	2	0	C.16	6	3	2	2	0	B.59
6	5	3	1	0	C.00	6	3	2	1	0	B.45
6	5	3	0	0	B.84	6	3	2	0	0	B.31
6	5	2	2	0	B.88	6	3	1	1	0	B.29
6	5	2	1	0	B.76	6	3	1	0	0	B.16
6	5	2	0	0	B.64	6	3	0	0	0	B.00
6	5	1	1	0	B.60	6	2	2	2	0	B.38
6	5	1	0	0	B.50	6	2	2	1	0	B.20
6	5	0	0	0	B.40	6	2	2	0	0	B.00
6	4	4	4	0	C.63	6	2	1	1	0	B.00
6	4	4	3	0	C.41	6	2	1	0	0	A.88
6	4	4	2	0	C.25	6	2	0	0	0	A.75
6	4	4	1	0	C.12	6	1	1	1	0	A.80
6	4	4	0	0	C.00	6	1	1	0	0	A.70
6	4	3	3	0	C.17	6	1	0	0	0	A.60
6	4	3	2	0	C.00	6	0	0	0	0	A.50

*Serial Log Dilutions.

TABLE 2. Examples of Typical Titration Results

Example	*10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	Value of A	LD_{50} Value From Table 1	$Log_{10}LD_{50}$
1.	6/6	$6/6^{A}$	$5/6^{B}$	$4/6^{C}$	$2/6^{D}$	$0/6^{E}$	0/6		2	C.38	4.38
2.		6/6	$6/6^{A}$	$4/6^{B}$	$2/6^{C}$	$2/6^{D}$	$0/6^{E}$		3	B.75	4.75
3.		6/6	6/6	$6/6^{A}$	$4/6^{B}$	$3/6^{C}$	$1/6^{D}$	$0/6^{E}$	4	B.84	5.84

* 10-Fold Dilutions.